



pl. No. 10/091,959
Amdt. dated 04/11/2005
Reply to Office action of 03/18/2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-22. (canceled)

23.(original) A magnetic read head structure, comprising:

 a bottom spin valve structure having a topmost layer that is a free layer having an upper surface;

 on said free layer, an exchange coupling layer;

 on said exchange coupling layer, two opposing plugs of a laminate of a conducting lead layer on an antiferromagnetic layer on a ferromagnetic layer, said plugs being separated by a gap that defines a read width for the structure;

 in said gap, a layer of oxides of said antiferromagnetic, ferromagnetic, and exchange coupling layers, said oxide layer being a protective layer for said free layer and providing for specular reflection of conduction electrons at said free layer upper surface; and

 said ferromagnetic layer being permanently biased in a longitudinal direction by exchange coupling with said antiferromagnetic layer and said free layer outside of said gap being permanently biased in a longitudinal direction by exchange coupling with said antiferromagnetic layer through said exchange coupling layer.

24.(original) The structure described in claim 23 wherein said exchange coupling layer is selected from the group consisting of Cu, Ru, Rh, and Ag, including being a laminate

Appl. No. 10/091,959
Amdt. dated 04/11/2005
Reply to Office action of 03/18/2005

of more than one member of said group.

25.(original) The structure described in claim 23 wherein said exchange coupling layer has a thickness between about 3 and 20 Angstroms.

26.(original) The structure described in claim 23 wherein said ferromagnetic layer is selected from the group consisting of NiFe, CoFe, and a combination of CoFe and NiFe.

27.(original) The structure described in claim 23 wherein said ferromagnetic layer has a thickness between about 5 and 50 Angstroms.

28.(original) The structure described in claim 23 wherein said antiferromagnetic layer is selected from the group consisting of NiMn, PtMn, IrMn, and RhRuMn.

29.(original) The structure described in claim 23 wherein said antiferromagnetic layer has a thickness between about 20 and 500 Angstroms.

30.(original) The structure described in claim 23 wherein said conducting lead layer is any combination of elements selected from the group consisting of Au, Rh, Ni, Ag, Cu, Ti, and Ta.

31.(original) The structure described in claim 23 wherein said conducting lead layer has a thickness between about 50 and 500 Angstroms.

32.(original) The structure described in claim 23 wherein said gap is between about 0.02 and 0.5 microns wide.

Appl. No. 10/091,959
Amdt. dated 04/11/2005
Reply to Office action of 03/18/2005

33.(original) A magnetic read head structure, comprising:

- a bottom spin valve structure having a topmost layer that is a laminate of CoFe and NiFe layers, said laminate being a free layer having an upper surface;
- on said free layer, an exchange coupling layer that is a laminate of Cu and Ru;
- on said exchange coupling layer, two opposing plugs of a conducting lead layer on an antiferromagnetic layer on a ferromagnetic layer, said plugs being separated by a gap that defines a read width for the structure;
- in said gap, a layer of oxides of said antiferromagnetic and ferromagnetic layers, said oxide layer being a protective layer for said free layer and providing for specular reflection of conduction electrons at said free layer upper surface; and
- said ferromagnetic layer being permanently biased in a longitudinal direction by exchange coupling with said antiferromagnetic layer and said free layer outside of said gap being permanently biased in a longitudinal direction by exchange coupling with said antiferromagnetic layer through said exchange coupling layer.

34.(original) The structure described in claim 33 wherein said exchange coupling layer contains between about 30 and 70 atomic percent of Ru.

35.(original) The structure described in claim 33 wherein said exchange coupling layer has a thickness of about 10 Angstroms.

36.(original) The structure described in claim 33 wherein said ferromagnetic layer is CoFe.

37.(original) The structure described in claim 33 wherein said ferromagnetic layer is about 45 Angstroms thick.

Appl. No. 10/091,959
Amdt. dated 04/11/2005
Reply to Office action of 03/18/2005

38.(original) The structure described in claim 33 wherein said free layer further comprises about 10 Angstroms of CoFe on about 20 Angstroms of NiFe.

39.(original) The structure described in claim 33 wherein said gap is between about 0.02 and 0.5 microns wide.